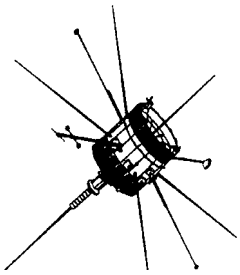
ISEE 1

International Sun Earth Explorer 1

Spacecraft Sketch	Mission Objective
	A major project objective of the International Sun-Earth Explorers (ISEE 1,2 >; 3) is to study the interaction of the interplanetary medium with the earth's immediate environment and to study the magnetosphere bow shock and magnetosheath in order to derive a better model of the interaction. The ISEE 1 6 2, which will be launched by the same vehicle, will investigate the structure and response to the solar activity of the various physical phenomena in the earth's magnetosphere, magnetopause, bow shock and hydromagnetic tail. The ISEE 3 will measure characteristics of interplanetary medium in an area that is essentially unperturbed by the earth's influence, so that the effect of the earth's presence and its environment can be removed from measurements that represent the effects of the sun.

TYPE OF MISSION	PROGRAM OFFICE	PROJECT LEAD CENTER	MANAGEMENT APPROACH	S/C CONTRACTOR	I&T CONTRACTOR
SPACE PHYSICS	SPACE SCIENCE	GSFC	AUGMENTED HYBRID	GSFC IN-HOUSE	GSFC IN-HOUSE

Payload Description

The International Sun-Earth Explorers (ISEE 1,2 >; 3) payloads include a total of 32 instruments. While each of the payloads has a separate scientific significance; maximum benefit will be obtained when all three spacecraft are operating simultaneously. Hence, the ISEE-1 & 2 will be launched together on the same launch vehicle, placed in an identical eccentric earth-orbit and separated by a controlled distance to allow for the separation of space and time effects necessary to study the interation of the solar wind with the magnetosphere. In conjunction, the ISEE 3 will be placed in an elliptical halo orbit about the Libration point between the earth and the sun and will measure conditions in the interplanetary medium and on the sun. The ISEE 1 spacecraft is configured in the form of a 16-sided cylinder, and includes an equipment shelf which is supported by struts and a thrust tube. One solar array is located forward of the equipment shelf and a second solar array is below the shelf. An omni S-band antenna is located near the top of the lower solar array. Attitude control system operations are electronically controlled and commanded from the ground with an automatic shut off.

INSTRUMENT NAME	ACRONYM	PI AFFILIATION	PRINCIPAL INVESTIGATOR	I&T CONTRACTOR
DC ELECTRIC FIELDS	NONE	GSFC	J. P. HEPPNER	GSFC
ELECTRONS & PROTONS	NONE	UCB	K. A. ANDERSON	UCB
ENERGETIC ELECTRONS & PROTONS	NONE	APL	D. J. WILLIAMS	NOAA
FAST ELECTRONS	NONE	GSFC	K. W. OGILVIE	GSFC
FAST PLASMA	NONE	LASL	S. J. BAME	LASL
HOT PLASMA	LEPEDEA	UNIV IOWA	L. A. FRANK	UNIV IOWA
HOT PLASMA COMPOSITION	NONE	LPARL	R. D. SHARP	LPARL
LOW ENERGY COSMIC RAY	NONE	MAX PLANCK	D. K. HOVESTADT	MAX PLANCK
PLASMA WAVE	NONE	UNIV IOWA	D. A. GURNETT	UNIV IOWA
QUASI-STATIC ELECTRIC FIELD	NONE	UCB	F. S. MOZER	UCB
TRIAXIAL FLUXGATE MAGNETOMETER	NONE	UCLA	C. T. RUSSELL	UCLA

Instrument Descriptions
The ISEE 1 DC Electric Fields, Data Point 657, is designed and built for the Goddard Space Flight Center to study the dynamic behavior of the magnetosphere and magnetosheath. The electric field is determined by measuring the difference in the floating potential between two ends of two co-linear wires extending perpendicular to the spin axis. The difference between the wires and the spacecraft is also measured.
The ISEE 1 Electrons and Protons, Data Point 470, developed at the University of California at Berkeley, studies particle acceleration in the earth's bow shock and magnetospheric substorms from interplanetary space near the earth to the inner magnetospheric regions. The instrument consists of two surface barrier semiconductor detector telescopes (one with a foil and one without a foil) and four fixed energy electric field particle analyzers. The analyzers measure electrons and protons separately at 2 and 6 thousand electron volts. An identical instrument is flown on the ISEE 2 spacecraft.
The ISEE 1 6 2 Energetic Electrons and Protons instruments separate electrons and protons by a magnet, which deflects each type of particle into one or more solid state detector telescopes where the pulse heights can be analyzed. Solid state detector systems are flown on both the ISEE 1 and 2 spacecraft to measure detailed energy spectra and angular distributions of protons in the energy range 20 keV to 2 MeV and electrons in the energy range 20 keV to 1 MeV.
The ISEE 1 Fast Electrons consists of two identical instruments mounted diametrically opposite one another in the spacecraft, each having three electrostatic analyzers. The axes of each set of analyzers are mutually perpendicular and are oppositely directed to those of the other set. Thus the net flux of electrons in a given direction can be determined, and a good approximation to the three dimensional velocity distribution function obtained. Two channelton electron multipliers are used on each of six analyzers. There are three modes of operation: I) solar wind 7.4 to 494 eV; 2) magnetosheath 10.5 to 2006 eV; and 3) magnetotail and solar 106 to 7077 eV.
The ISEE 1 & 2 Fast Plasma instruments are designed to determine electron and ion velocity distributions in one-, two- and three-dimensional form. These determinations are made using identical 9-n degree spherical section electrostatic twodimensional and three-dimensional analyzers. The ISEE 1 experiment will also include a solar wind ion 150 degree spherical section analyzer. The Los Alamos Scientific Laboratories supplies the sensor portion and the Max Planck Institute supplies the electronics for both instruments.
The ISEE 1 Hot Plasma (LEPEDEA), Data Point 496, is developed by the University of Iowa to obtain electron and positiveion energy spectra and angular distributions. The instrument consists of a quadrispherical LEPEDEA, employing seven continuous channel electron multipliers in each of its two electrostatic analyzers - one analyzer for electrons and one for protons. An identical instrument is flown on ISEE 2...
The ISEE 1 Hot Plasma Composition, Data Point 475, is developed for Johns Hopkins University by Lockheed Palo Alto Research Laboratory to determine source, transport, and energization of the magnetospheric plasma, and to measure composition of hot plasma in space. This instrument includes an electrostatic energy analyzer followed by a combined cylindrical, electrostatic/magnetic mass analyzer. A combination of electron multipliers are used as the detectors.
The ISEE 1&3 Low Energy Cosmic Ray instruments consist of two sensors: I) ultra low energy nuclear charge, total energy, and ionic charge assembly (ULEZEQ); and 2) ultra low energy wide angle telescope (ULEWAT). Charged particles entering the ULEZEQ are electrostatically deflected in four deflection systems and measured by eight silicon detectors. The ULEWAT and its array of proportional counters is backed by an anti-coincidence detector with incoming particle residual energy determined by two solid state detectors.
The ISEE 1 Plasma Wave, Data Point 497, is designed and built by the University of Iowa to measure wave phenomena in the magnetosphere and the solar wind. The instrument uses Triaxial Search Coil Magnetometers and Triaxial Electric Dipoles as magnetic and electric field sensors. The magnetometers investigate magnetic fields in the frequency range 1 Hz to 10 kHz. The electric field dipoles inputs are received by a 12-channel spectrum analyzer that responds in the 100 Hz to 200 KHz energy range. Duplicate instruments are flown on the ISEE 1 and 2 spacecraft.
The ISEE 1 Quasi-static Electric Field, built by the University of California, obtains fields from measurements of the potential difference between a pair of spheres, each of which is boom mounted. The measured potential differences are converted to electric field components in the spacecraft frame of reference by dividing each measurement by the sphere separation distance, after which the resulting fields are converted to Earth-fixed, inertial, or other frames of reference by subtracting the electric field which is induced by the spacecraft motion through the magnetic field.
The ISEE 1 Quasi-static Electric Field, built by the University of California, obtains fields from measurements of the potential difference between a pair of spheres, each of which is boom mounted. The measured potential differences are converted to electric field components in the spacecraft frame of reference by dividing each measurement by the sphere separation distance, after which the resulting fields are converted to Earth-fixed, inertial, or other frames of reference by subtracting the electric field which is induced by the spacecraft motion through the magnetic field.
The ISEE 1 Triazial Fluxgate Magnetometer, Data Point 479, is designed and built by UCLA to measure static and time varying fields. An identical instrument is flown on ISEE 2. Three ring core sensors are boom mounted. A flipper is used for calibration. The electronics unit is on the main body of the spacecraft at the foot of the boom. The magnetometer has two operating ranges in each vector component. The data are digitized and averaged within the instrument to provide increased resolution and to provide Nyquist filtering.

Launch
10/22/77 (1)
10/22/77 (2)
8/12/78 (3)